FAA-E-2512
December 1, 1971

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION SPECIFICATION

ELECTRON TUBE, CATHODE RAY, METAL CONE, 22 INCH, CIRCULAR

1. SCOPE

1.1 Scope.- The device covered by this specification is a 22 inch, high resolution cathode ray tube with a 62 degree, magnetically driven deflection angle, electrostatic focus and aluminized screen. The tube features a metal cone, a glass faceplate, a tempered glass safety panel and an electrical insulation silicone rubber boot.

These tubes will be used in the Automated Radar Terminal System (ARTS III) of the National Airspace System.

2. APPLICABLE DOCUMENTS

2.1 FAA specification.- The following FAA specification of the issue specified in the invitation for bids or request for proposal, forms a part of this specification:

FAA-STD-013 Quality Control Program Requirements

2.2 Military documents.- The following military documents of the issue in effect on the date of invitation for bids or request for proposals form a part of this specification to the extent specified herein:

*MIL-E-1 Electron Tubes, General Specification for

MIL-STD-130 Identification and Marking of U.S. Military Property.

MIL-STD-1311 Test Methods for Electron Tubes

MIL-E-75 Electron Tube, Preparation for delivery of

2.3 Industry specifications.- The following specifications of the issues in effect on the date of invitation for bids or request for proposals form a part of this specification to the extent specified herein:

GTA61-1-20 Television Receiver Safety Windows

GTA62-8-7, Rev. 1 Safety Windows for Laminating to TV Tubes

(Individual copies of the above two specifications may be obtained by requesting them from the Glass Tempering Association, 1325 Topeka Ave., Topeka, Kansas, 66612, Attention: Mr. William J. Birch.)

(Copies of the applicable FAA specifications may be obtained from the Federal Aviation Administration Contracting Officer issuing the Invitation for Bid or Request for Proposal. Requests should fully identify material desired; i.e., specification numbers, dates, amendment numbers; also, requests should state the contract involved or other use to be made of the requested material.)

(*Specification MIL-E-1, which includes a large basic specification and over 1000 tube specification sheets, is not generally available. However, where adequate justifying statements are included in written requests directed to FAA (attention of the Contracting Officer) needed sections of MIL-E-1 may be obtainable. Requests should contain separate justifications for the basic specification (if needed) and for specific supplement sheets covering individual tubes. Unjustified requests for MIL-E-1 cannot be processed.)

3. REQUIREMENTS

3.1 Equipment to be furnished by the contractor.- The contractor shall deliver cathode ray tubes (CRT) in the quantities and to the locations specified in the contract schedule. The CRT's shall conform to all the requirements set forth in this specification. All features required to meet performance requirements shall be incorporated even though the features may not be specifically provided for or described herein.

The device shall consist of the cathode ray tube and shall include a silicone rubber electrical insulation boot. The process for molding the insulation boot is described in this specification.

3.1.1 Abbreviations, symbols and definitions.- Abbreviations, symbols and definitions shall be as specified in Appendix A and B of MIL-E-1.

3.2 Materials.- The materials used for the manufacture of each part shall be as specified herein. When the materials or class of materials are not specified, a material shall be used which will enable the device to meet the requirements of this specification. The materials, finishes and markings, shall not blister, crack, flow or be adversely affected when exposed to the storage, operating or environmental conditions of this specification. Materials shall be in accordance with paragraph 3.5 of MIL-E-1.

3.2.1 Physical configuration.- The CRT shall conform to the physical dimensions and other requirements outlined in figures 1 and 2.

The CRT shall be provided with the insulated rubber boot specified in figure 3 and the pertinent paragraphs in this specification.

The tube shall have a metal cone, a glass faceplate and funnel assembly, and a bonded, tempered, yellow-glass safety panel as specified in GTA 62-8-7, using bonding resin TV-720 with hardener DEH 66 (Dow Chemical Co.) or equivalent. The glass safety panel shall be euroglass no. 228 or equivalent.

3.2.2 Markings.- Each CRT delivered under the requirements of this specification shall be marked in accordance with MIL-STD-130. Each tube shall be marked with the following information:

(a) Manufacturer's part number
(b) Manufacturer's identification
(c) Date of manufacture

Markings on the metal cone shall be located 6.0 inches minimum from the face of the tube.

Permanence of markings shall be where applicable as described in method 1105 of MIL-STD-1311.

3.2.3 Conductors.- Electrical conductors shall meet the requirements of paragraph 3.6.1 of MIL-E-1.

3.2.4 Base connections.- The base connections shall meet the requirements of paragraph 3.6.3 of MIL-E-1 and the additional requirements of this specification.

3.3 Internal characteristics.

3.3.1 Deflection.- The electron beam shall be capable of being deflected plus or minus 31 degrees as illustrated in figure 1. The tube shall use magnetic deflection.

3.3.2 Focus.- The CRT electron beam shall be electrostatically focused.

3.3.3 Electrical Ratings.- The tube shall meet the ratings listed in table I.

	Ef	Ec1	Ec2	Eb1	Eb2	Ehk	Rg1	Rg2
	V	VDC	VDC	VDC	VDC	VDC	MEG	MEG
Maximum	7	0	800	+500	20000	180	1.5	.5
Minimum	5.8	-140		-200		-180		
Test Conditions	6.3	Adjust	600	Focus	18000			

Symbology in accordance with MIL-E-1.
All voltages with respect to cathode.

3.3.4 Grid No. 2 current.- Grid number 2 current (IC2) shall not exceed plus or minus 15 microamperes when Ec1 is set to 0 volts. Measurement shall be as described in method 5201.1 of MIL-STD-1311.

3.3.5 Interelectrode capacitance.- Interelectrode capacitance shall be:

(a) Ck to all other elements combined 5pf maximum

(b) Cg1 to all other elements combined 13pf maximum

Interelectrode capacitance shall be measured in accordance with method 1331 of MIL-STD-1311.

3.3.6 Pressure (Implosion).- The tube shall be capable of withstanding an external pressure of 35 lb/inch. The procedure for checking external pressure shall be in accordance with method 1141 of MIL-STD-1311.

3.3.7 Voltage breakdown.- When the tube is subject to the tests outlined in method 5201.2 of MIL-STD-1311, there shall be no recurrent breakdown between elements.

3.3.8 Voltage breakdown (Magnetic).- There shall be no breakdown between elements when the tube is subject to the tests described in method 5201.4 of MIL-STD-1311 and the following provision.

After a heating time of at least four minutes, the voltages specified in paragraph 3.3.18 herein shall be applied for at least 30 seconds. One arc may be permitted providing that a second arc does not occur within three minutes following the occurrence of the first arc.

3.3.9 Gas ratio (Gr).- Under the conditions described in method 5206.2 of MIL-STD-1311, the gas ratio shall not exceed 0.25.

3.3.10 Bulb, screen and faceplate quality.- The blemish criteria shall be as specified in method 5106 of MIL-STD-1311 except that the number and sizes of spots, holes, and blemishes shall not exceed those specified in paragraphs 3.3.10.1 through 3.3.10.8. The faceplate quality circle shall be 20 inches in diameter.

3.3.10.1 Holes and opaque spots.- The acceptable size and number of spots (holes and opaque spots) shall be as follows:

0.010" or less	Disregard
0.011" to 0.020"	18 or less. Allow 4 or less in a 1" diameter circle
0.021" to 0.050"	15 or less. Minimum separation of ⅓"
0.051" to 0.060"	6 or less. Minimum separation of 1"

3.3.10.2 Size and number of colored spots.- The size and numbers of colored spots shall meet the following criteria:

0.010" or less	Disregard
0.011" to 0.050"	15 or less. Minimum separation of 1"
0.051" to 0.060"	4 or less. Minimum separation of 1"

3.3.10.3 Lamination plate - size and number of spots (opaque and dead).- The following shall apply:

0.010" or less	Disregard
0.011" to .020"	10 or less. Minimum separation of 2"
0.021" to .030"	7 or less. Minimum separation of 2"
0.031" to .040"	5 or less
0.041" to .060"	4 or less
Over .060"	none allowed

3.3.10.4 Combined spots for finished tubes.- The total number of combined spots for screen, faceplate, resin and lamination plate on finished tubes shall be as follows:

.010" or less	Disregard
.011" to .040"	Allow up to 30
.041" to .060"	Allow up to 10

3.3.10.5 Elliptical defects.- For elliptical defects in a form of stones, bruises and dead spots, etc., the following equivalent diameter formula shall be used:

$$\text{Equivalent diameter} = \frac{\text{length} + \text{width}}{2}$$

3.3.10.6 Contour variations.- For face contour variations, MIL-E-1, Appendix D, paragraph 60.2.3 shall apply.

3.3.10.7 Surface scratches.- For surface scratches, the following limits shall apply:

Width	.002" to .0059", maximum length 1", minimum separation 2"
	.006" and over--none allowed

3.3.10.8 Edge chips.- For edge chips, the maximum permissible dimensions listed below shall apply:

Width	.062" to .125"
Length	.188"
Depth	.040"

3.3.11 Spot position.- The spot position as described in method 5231.1 of MIL-STD-1311 shall fall within a circle concentric with the CRT face, and having a radius of 12 mm.

3.3.12 Grid cutoff voltage (Ec1).- The grid cutoff voltage as described in method 5241 of MIL-STD-1311 shall be a minimum of -65 Vdc and a maximum of -105 Vdc with reference to cathode.

3.3.13 Grid no. 1 leakage.- Grid no. 1 leakage shall be as described in method 5251.2 of MIL-STD-1311 except that the leakage shall not exceed 5μ Adc.

3.3.14 Anode no. 1 leakage.- Anode no. 1 leakage shall be as described in method 5251.4 of MIL-STD-1311 except that the leakage shall not exceed 15μ Adc.

3.3.15 Modulation.- Modulations shall be as described in method 5223 of MIL-STD-1311 except that the maximum grid drive (Ec1) shall be +40 volts dc. This value shall be the drive voltage above cutoff that yields a brightness output of 28 foot-lamberts, measured with a 20-inch square blanked raster, active field time of 90 per cent, active line time of 83 per cent, focused for best overall focus (not for best focus at faceplate center) and using a minimum of 840 active lines; to be measured anywhere within the usable diameter. Weston 759 foot-lambert meter, or equivalent, shall be used. Cathode current shall not exceed 300 uA peak current with phosphor screen at room temperature. Frame rate shall be 30 cps with 2/1 field interlace.

3.3.15.1 Brightness variation.- Brightness variation over the entire CRT usable area shall be less than 15 per cent. The permissible defects of paragraph 3.3.10 are excluded from this requirement.

3.3.16 Resolution.- With focus as described in 3.3.15, the line width at all points of the CRT shall be less than 0.021 inches as measured by means of two slit analyzer. An equivalent test by other techniques may be used in production testing which correlates with this procedure. Additionally, with a sine wave voltage applied to the grid such that the frequency represents a minimum of 420 white dots across the central horizontal and vertical axis, and with the peak voltage of the sine wave such that it establishes the same grid-to-cathode voltage relationship required in 3.3.15 (a maximum of 80 volts peak-to-peak) the dots shall be resolvable by the eye at all points within the usable surface area without refocusing after adjusting for best overall focus as in 3.3.15. These tests shall be made using a high-quality yoke such as Syntronic no. C2821 or equivalent. The yoke need not be corrected for raster distortions.

3.3.17 Heater current.- Heater current (If) under conditions as described in method 1301 of MIL-STD-1311, shall be a minimum of 450mA ± 10 per cent for Ef = 6.3 volts.

3.3.18 Stray light emission.- Stray emission shall be as described in method 5216.2 of MIL-STD-1311 under the conditions of Eb2 = 20,000V, Ec2 = 800Vdc, Eb1 = 0vdc, Ec1 = -40Vdc.

3.3.19 Focusing.- Focusing voltage as described in method 5246 of MIL-STD-1311 shall be a minimum of zero (0) volts dc and a maximum of 400Vdc positive as measured under the conditions of 3.3.15 and 3.3.16.

3.3.20 Heater-cathode leakage.- Heater cathode leakage shall be as described in method 5251.1 of MIL-STD-1311.

3.3.21 Grid no. 2 leakage.- Grid no. 2 leakage shall be as described in method 5251.3 of MIL-STD-1311 except that the leakage shall not exceed 15 μA.

3.3.22 Safety marking.- A red color shall be used on the base of the tube, shall be visible when viewing the side of the base and shall denote the tube as being safety laminated.

3.3.23 Dimensions.- Dimensions, to establish uniform criteria of paragraph 20 (b) (2) of Appendix D of MIL-E-1, shall be as shown in figure 1.

In addition, the following limits shall be maintained:

(a)	Radius of faceplate:	Minimum 150" Nominal 165" Maximum 190"
(b)	Radius of lamination plate:	Minimum 190" Maximum 225"
(c)	Thickness of lamination plate (implosion shield)	
	Euroglass #228 shield	0.1575 Nominal
(d)	Thickness of epoxy layer:	0.0625" ± 10 per cent at center of faceplate. In addition, the uniformity of the epoxy layer between the lamination plate and the tube faceplate shall be such that the thickness of epoxy layer at each point on the periphery of the lamination plate shall not differ from the thickness at each point on the periphery by more than 1/8 inch.

3.3.24 Bulb alignment.- The bulb shall be supported vertically and rotated by a suitable mechanism similar to that shown in figure 2, which shall permit the neck to run true to the center of rotation. Five (5) dial indicators perpendicular to the cone surface shall be used to determine the amount of neck and bulb misalignment. The maximum misalignment of neck and bulb shall be 0.400" and the maximum face tilt shall be 0.375". The neck and base straightness shall be determined by the insertion of the tube neck in a cylinder five (5) inches long and 1.5 inches maximum inside diameter. This cylinder shall move freely between the reference line and the base of the assembled tube.

3.3.25 Phosphor.- The CRT shall be a single cascade using a P28 yellow base and a mixture of P2 and P22B as the blue component, using approximately the following measures per CRT.

P28	16 grams
P2	4 grams
P22B	7 grams

3.4 Insulation boot.- Each cathode ray tube shall include a silicone insulating boot conforming with the requirements specified in figure 3 and the following paragraphs.

3.4.1 Mold preparation.- The internal mold surfaces shall be free of all dirt residue and other contaminants. Cleaning shall be accomplished by wiping the surfaces with paper towels saturated with isopropyl alcohol.

3.4.2 Mold releasing.- Mold releasing shall be accomplished by applying a detergent solution (Vel 7 per cent solution or equivalent) to the internal mold surfaces. Fifteen minutes shall be allowed for the mold to dry at room temperature.

3.4.3 Tube preparation.- The exterior surface of the metal cone shall be free of paint for a distance of approximately five inches as shown in figure 3. The unpainted surface shall be cleaned using isopropyl alcohol and clean colitho pads or equivalent. The groove between the implosion shield and the face of the tube shall be cleaned with clean colitho pads saturated with isopropyl alcohol. This cleaning operation shall be repeated over the total area to be molded using isopropyl alcohol and colitho pads. The surface area of that portion of the tube which is to be potted shall be primed with General Electric GE 4004 primer or equivalent. After 15 minutes, the priming operation shall be repeated and shall be allowed to dry for ½ hour, but not to exceed two (2) hours. After placing the tube in the mold, the tube shall be centered using a scale and adjusting screws on the side of the mold.

3.4.4 Material preparation.- The insulating boot material shall be Stauffer-Wacker silicone rubber SWS-832/RTV with catalyst or equivalent. The molded boot shall be free of voids or bubbles and foreign particles. The cured compound shall be uniform in color and consistency, tackfree, and have a minimum instantaneous Shore A hardness of 45. The material

shall be stirred in its container until uniform in color and texture. The materials shall be combined in the following ratio:

(a)	Base compound	100 parts per weight
(b)	Catalyst liquid	0.3 parts by weight per 100 grams of base compound
(c)	Paste	4.0 parts by weight per 100 grams of base compound

The mixed material shall be placed in a vacuum atmosphere, minimum of 29 inches of mercury, for two to three minutes after foaming has subsided.

3.4.5 Pouring the material.- The material shall be poured into the mold slowly and it shall be allowed to flow around the sides to the back of the mold. The material shall be poured until it is within 0.050 inches of the top of the mold on all sides.

3.4.6 Curing.- The material shall be cured by one of the following schedules:

(a) Six hours at 60 degrees C plus 18 hours at room temperature.

(b) Twenty-four hours at room temperature.

3.4.7 Alternate material and procedures.- The contractor shall not use alternate material or deviate from the procedures specified herein unless prior approval has been obtained from the Government.

3.5 Reliability requirements.

3.5.1 Operating life.- The CRT specified herein shall be designed for an operating life in excess of 10,000 hours.

3.5.2 Failure rate.- The failure rate shall not exceed 100×10^{-6} failures per hour during the specified life and when subjected to any combination of the specified environment.

3.5.3 Failure analysis.- The manufacturer shall conduct state-of-the-art failure analysis on all documented failures returned to him because of abnormal performance. The results of such failure analysis are required by the Government not later than 30 days after the failed CRT is made available for analysis.

3.5.4 Life test.- Life test shall be as described in Appendix E, paragraph 60 of MIL-E-1 and in paragraph 4.7.1 (c) and method 1501 of MIL-STD-1311 with the addition of the following restraints:

Eb2 = 18000Vdc	Ib = 75μAdc
Ec2 = 600Vdc	t = 1000 hours

The total number of tubes sampled for life testing shall not exceed 1.5 per cent of the quantity supplied under the contract during one calendar year. Life test end point modulation shall be as described by paragraph 4.7.3 of MIL-E-1 where applicable. Under the drive voltage conditions, the same brightness as described in 3.3.15, the maximum Ec1 shall be 48 Vdc. Life test resolution, after 1000 hours, shall be a minimum of 380 white dots across the central horizontal and vertical axis. This is to be measured anywhere within the usable diameter at the current required initially for a particular tube to obtain the initial brightness at the beginning of life test. Reference should be made to applicable resolution requirements in 3.3.16 herein.

4. QUALITY ASSURANCE PROVISIONS

4.1 General requirements.- Unless otherwise specified in the contract, all tests shall be made by the contractor and witnessed by a Government inspector at the contractor's plant. The Government reserves the right to require additional tests other than those below in order to determine compliance with all the requirements of the specification. The contractor shall furnish all services and test equipment required in connection with testing and establishing proof of compliance with specification requirements. The Government reserves the right to waive inspection at the contractor's plant. If inspection is waived, the contractor shall furnish certified test data complying with the approved procedures and forms (paragraph 4.5.4) and describing the readings or results obtained during the inspection and tests required for the applicable contract specifications. The test data must demonstrate that the tube meets contract requirements, include the statement "this certifies that unit fully meets all technical requirements of the contract," and be dated and signed by a responsible official of the contractor. The contractor shall provide and maintain a quality control and test program conforming with the requirements of FAA-STD-013A.

4.2 Factory inspection and tests.- The inspections and tests shall be performed at the contractor's plant.

4.3 Production inspection.- Each laminated cathode ray tube to be delivered under the contract shall be given a mechanical and electrical inspection. The mechanical inspection shall include a visual examination to determine compliance with the applicable specifications. The electrical inspection shall include tests to show complicance with the requirements of this specification. These tests shall not be restricted to those listed in section 4 of this specification.

4.4 Safety tests.- Three (3) laminated tubes shall be taken at random from production for one-time safety testing. This shall be done for each continuous lamination production run. A continuous lamination production run is defined as an uninterrupted run for a duration of three months, although tubes other than those specified herein may be interposed during the lamination production run. The tubes used for safety testing shall be furnished by the contractor and shall be in addition to the quantity stipulated in the contract schedule.

One tube shall be tested for frontal impact. A blunt-nosed, five pound steel weight on a chain shall be swung into the faceplate from a point five feet above the tube to produce 25 foot-pounds of force on the safety glass at a point halfway between the center and the rim. This shall be performed on the same tube at the same place two times in a row. The tube shall not explode or implode; glass shall not be forcefully propelled or forcefully thrown outward from the tube face but shall disperse in a manner similar to an identical tube not under vacuum. For the above test, the tube (except for the tube face) shall be enclosed in a shatter-proof container. If the vacuum of the tube is maintained after the above test, this tube shall then be hit by a heavy piece of wood on the end of the neck at the base in a direction in line with the axis of the tube so as to cause the gun and neck to shoot into the tube toward the faceplate. The tube shall not implode or explode violently and the laminated glass shall not be damaged or cracked by the action of the gun or neck.

The second tube shall be dropped a distance of six feet face down onto a concrete floor. It shall not implode or explode violently; glass from the faceplate, neck, bell or laminate shall not be forcefully propelled or thrown away from the immediate area of the tube but shall disperse in a manner similar to an identical tube not under vacuum.

The third tube shall be dropped a distance of six feet (neck down) onto a concrete floor. The tube shall not implode or explode violently and glass from the laminate and faceplate shall not be forcefully propelled or thrown away from the area of the faceplate. Glass from the neck, bell, laminate and faceplate shall disperse in a manner similar to an identical tube not under vacuum.

4.5 Preparation for a regularly-scheduled testing and inspection.

4.5.1 Preliminary tests.- Prior to the time the contractor notifies the Government that the initial production tubes are ready for inspection, he shall make all tests which are necessary to prove compliance with specification requirements.

4.5.2 Preliminary test data.- The contractor shall submit to the Government a certified copy of the test data covering all preliminary tests made under 4.5.1. This test data shall be submitted together with (or in advance of) notification of readiness for inspection (4.5.3).

4.5.3 Notification of readiness for inspection.- When the contractor has five or more production tubes completed, i.e., tubes produced to meet all specification requirements, he shall notify the Government that he is ready for inspection and tests. Such notification shall be given in time to reach Government at least five days before the contractor desires inspection to start.

4.5.4 Proposed test methods.- A comprehensive outline including tentative test data forms of the methods and procedures which the contractor proposes for use in conducting the tests in accordance with this specification shall be prepared by the contractor and furnished in duplicate to the Government at least 20 days before the date scheduled for testing the initial tubes. One copy will be returned to the contractor either with a statement that the proposed methods and forms are approved for use by the contractor or with a statement suggesting modification to the proposed methods and forms. In the event of the latter, the contractor shall submit his revised proposal. The final forms will serve as the test data sheets for the testing of tubes on the contract.

4.6 Classification of tests.- Two kinds of regular tests in addition to safety tests shall be required as follows:

(a) Type tests
(b) Production tests

4.6.1 Type tests.- Type tests shall consist of all the tests enumerated in paragraph 4.7.

4.6.1.1 Type test sampling.- The tube used for type testing shall be furnished by the contractor and shall be in addition to the quantity stipulated in the contract schedule.

4.6.1.2 Type test tube selection.- Selection of a tube for type testing shall be made at random by a Government Representative from all the tubes available in a given contract quantity group.

4.6.1.3 Release of tubes for production testing.- Successful completion of each type test except for the life test portion of the type test shall release the tubes in the next contract quantity group for production testing; with the exception of the one selected from the latter group for type testing.

4.6.1.4 Exception to type test selection.- If contract delivery schedule does not allow enough time to complete the life test for each contract quantity group, the tubes for the life test shall be selected from the first and/or second contract quantity group. The number of tubes selected shall equal the total number of tubes which would normally be tested. Noncompletion of the life test shall not prevent release of tubes for production testing.

4.6.2 Production tests.- Production tests shall consist of those tests designated (*) in paragraph 4.7. The Government reserves the right to require additional production tests other than those listed in order to determine compliance with all the requirements of this specification.

4.7 Tests.- Tests to show compliance with the requirements of this specification shall include but shall not be restricted to those paragraphs listed below. The tests shall be performed in accordance with the methods and procedures of paragraph 4.5.4.

PARAGRAPH

*3.3.4	3.3.5	3.3.6
*3.3.7	*3.3.8	*3.3.9
*3.3.10	*3.3.11	*3.3.12
*3.3.13	*3.3.14	*3.3.15
*3.3.16	*3.3.17	*3.3.18
*3.3.19	*3.3.20	*3.3.21
*3.3.22	*3.3.23	*3.3.24
3.5.4		

5. PREPARATION FOR DELIVERY

5.1 General.- Packing and marking shall be in accordance with MIL-E-75. Each tube shall be individually boxed and adequately marked. Handles, if provided, shall be on the ends of the container.

5.2 Faceplate protection.- Adhesive backed protective paper shall be applied to the faceplate of each tube before shipment. Paper shall be easily removable by peeling.

6. NOTES.- None

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FOR FIGURES 1 TO 3, SEE PAGES 14 TO 19

EIA-E-2512

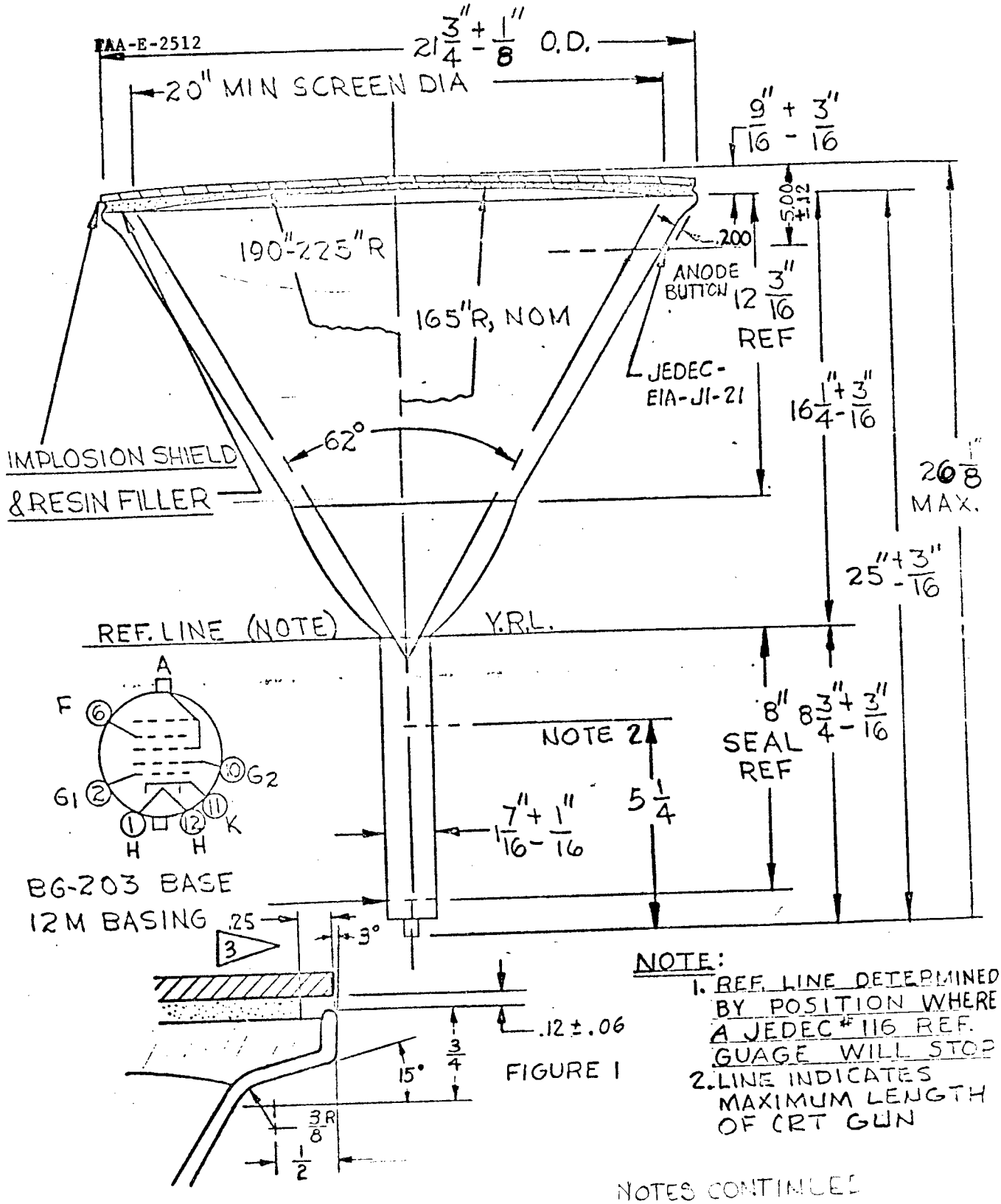


FIGURE 1

NOTE:

1. REF. LINE DETERMINED BY POSITION WHERE A JEDEC #116 REF. GUAGE WILL STOP
2. LINE INDICATES MAXIMUM LENGTH OF CRT GUN

NOTES CONTINUED IN FIGURE 2

(NOTES CONTINUED)

3 RESIN BETWEEN GLASS FACE AND IMPLOSION SHIELD SHALL BE REMOVED FOR A MINIMUM DISTANCE OF .25 INCHES (MAXIMUM OF .50) FROM OUTSIDE EDGE OF IMPLOSION SHIELD AS INDICATED

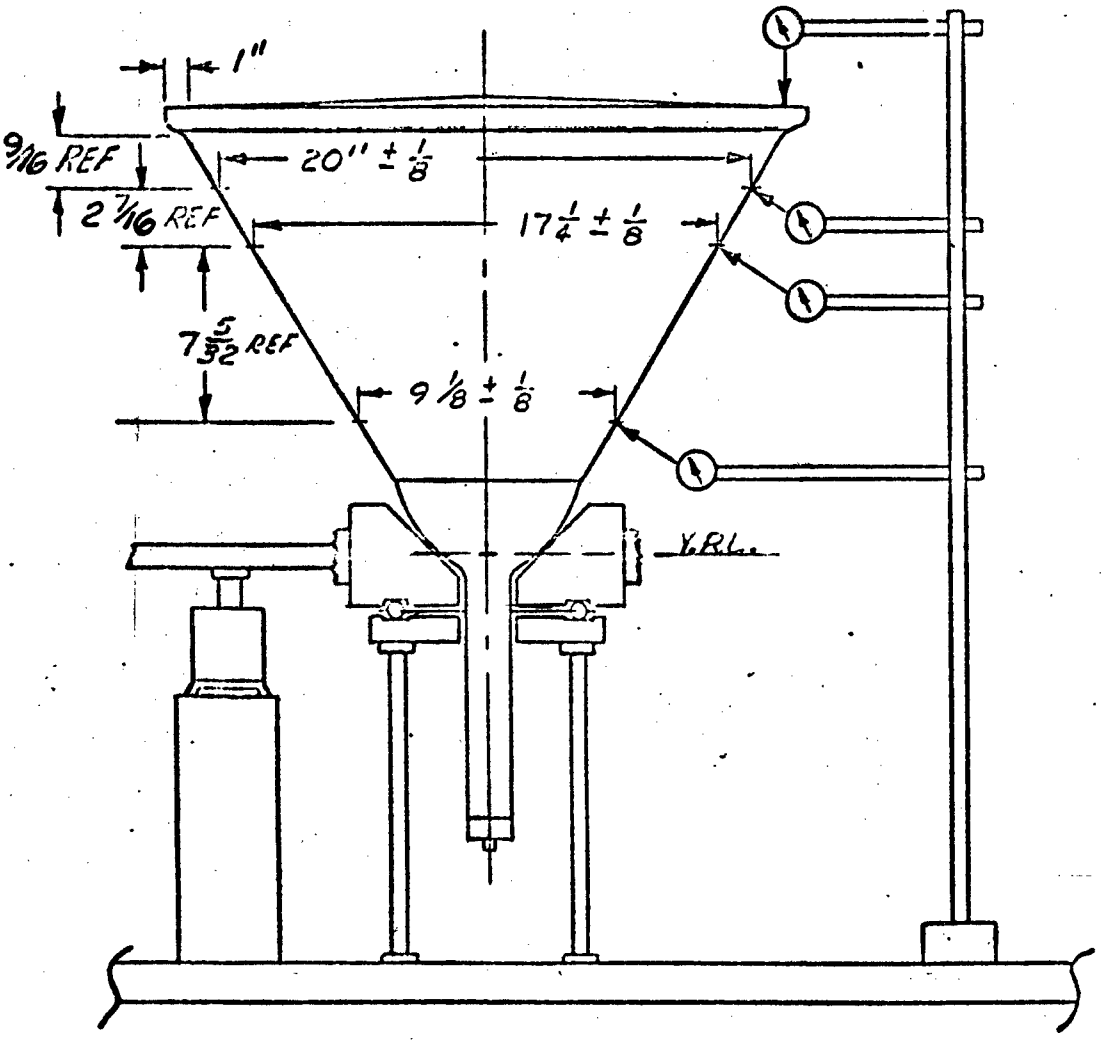
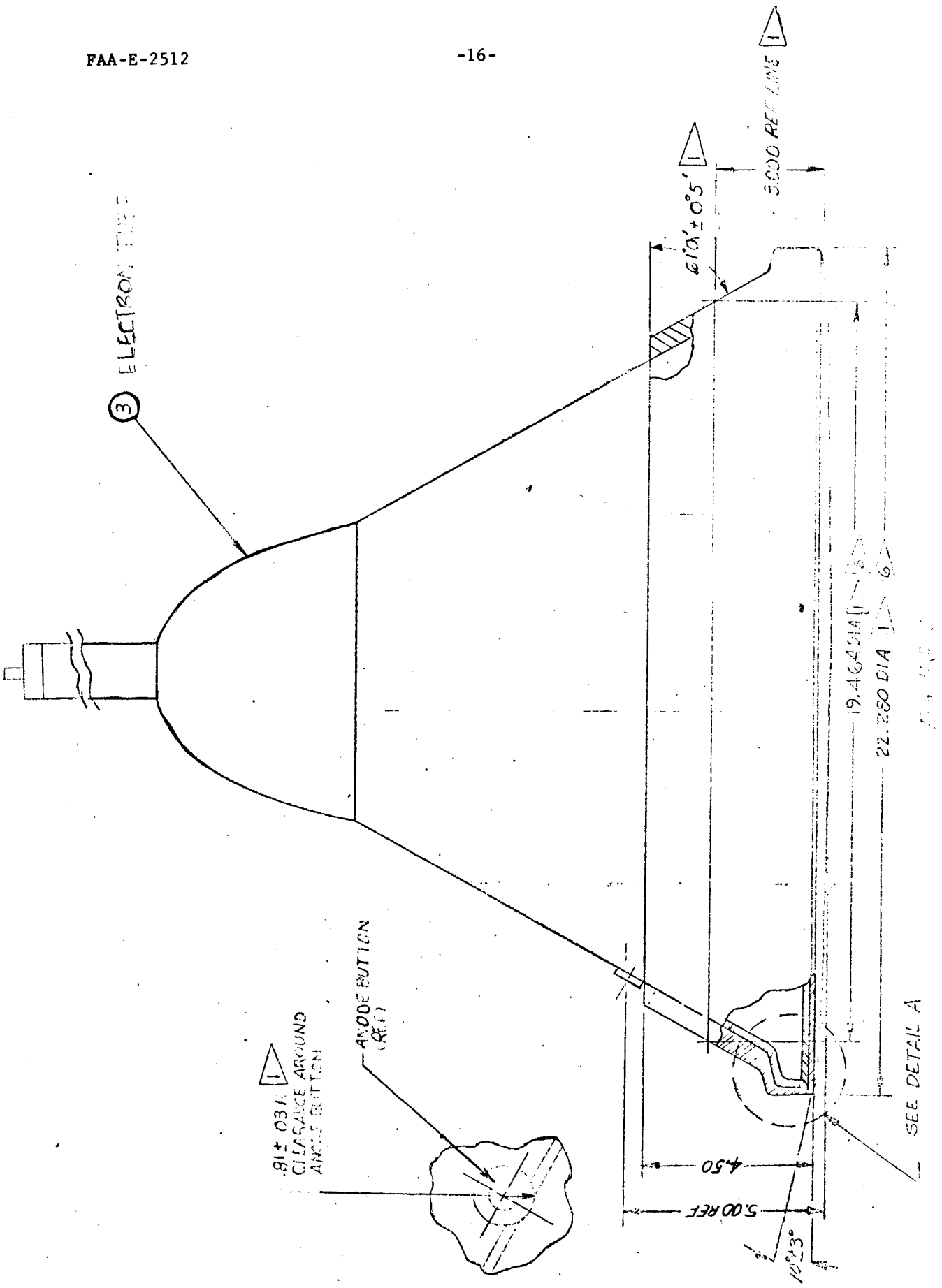


FIGURE 2


3
ELECTRON
61°0' ± 0°5'
3.000 REF LINE
19.464 DIA
22.280 DIA
SEE DETAIL A
4.50
5.00 REF
10°23°
ANODE BUTTON
(REF)
CLEARANCE AROUND

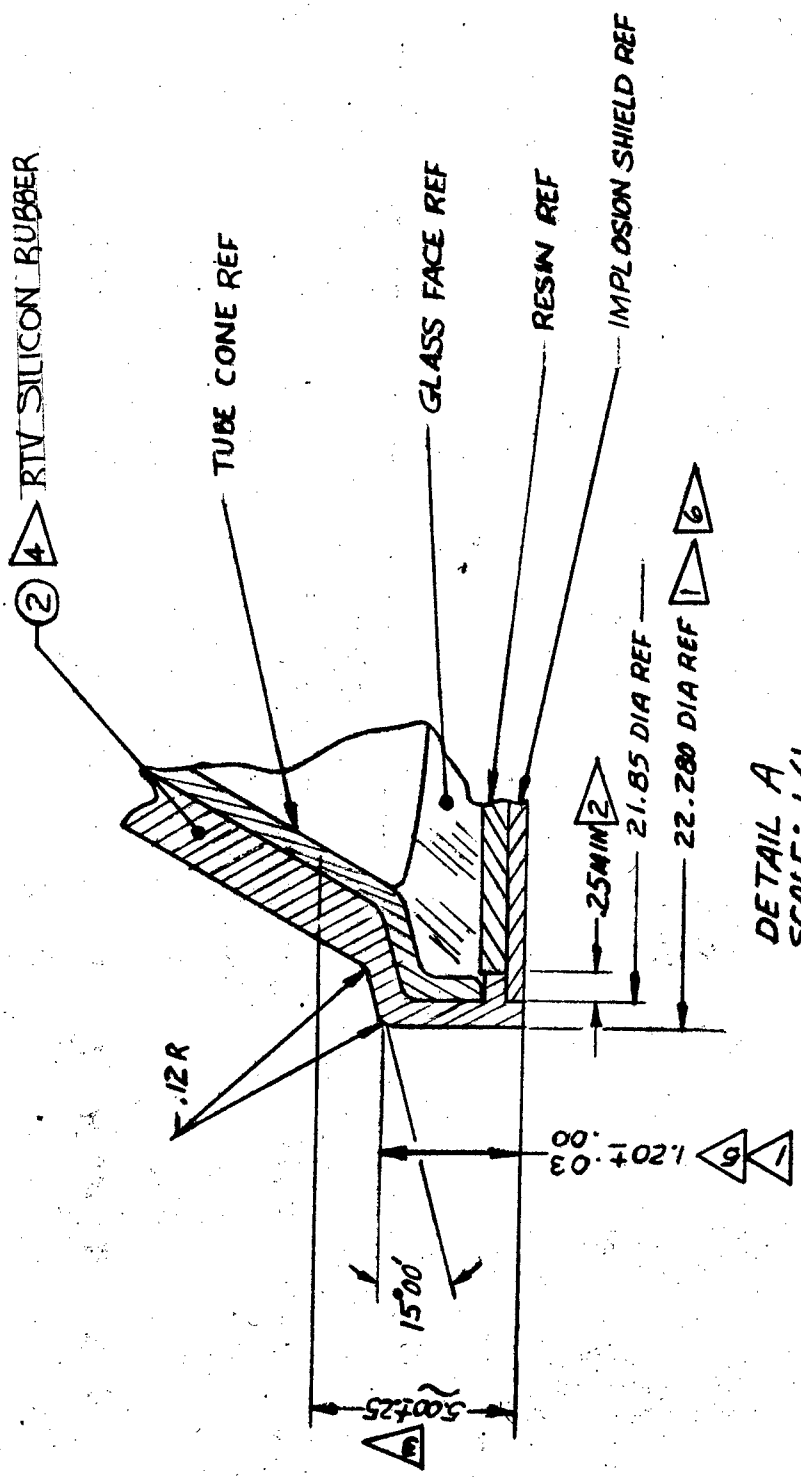


FIGURE 3 (CONTINUED)

NOTES:

1. DIMENSIONS FLAGGED ARE TO BE USED FOR MOLD FOR CASTING ITEM 2 ON ITEM 3. FINAL DIMENSIONS OF PART MAY VARY DUE TO CHANGE OF MATERIAL VOLUME DURING CURING

2. RESIN BETWEEN GLASS FACE AND IMPLOSION SHIELD SHALL BE REMOVED FOR A MINIMUM DISTANCE OF .25 INCHES MAXIMUM OF .50 FROM OUTSIDE EDGE OF IMPLOSION SHIELD AS INDICATED. ITEM 2 SHALL FILL THE VOID

3. TUBE TO BE FREE OF ALL PAINT TO DIMENSION SHOWN. ITEM 2 SHALL ADHERE TO TUBE IN THIS AREA.

4. SILICONE RUBBER, ITEM 2 SHALL BE FREE OF ALL FOREIGN INCLUSIONS AND/OR AIR BUBBLES AFTER POURING AND CURING

FIGURE 3 (CONTINUED)

5 BOTTOM SURFACE OF SILICONE RUBBER SHALL BE FLUSH WITH IMPLOSION SHIELD WITHIN .020 AFTER CURING. PROJECTION OF RUBBER UP TO .020 IS PREFERRED

6 OUTSIDE SURFACE OF RUBBER SHALL BE CONCENTRIC WITH CENTERLINE OF TUBE WITHIN .050 TIR

FIGURE 3 (CONTINUED)